substrates for integrated circuit chips. Space transformer 54 has, in the preferred embodiment, a surface layer 56 comprising a plurality of thin dielectric films, preferably polymer films such as polyimide, and a plurality of layers of electrical conductors, for example, copper conductors. A process for fabricating multilayer structure 56 for disposing it on surface 58 of substrate 60 to form a space transformer 54 is described in US patent application Serial No. 07/695,368, filed on May 3, 1991, entitled "MULTI-LAYER THIN FILM STRUCTURE AND PARALLEL PROCESSING METHOD FOR FABRICATING SAME" which is assigned to the assignee of the present invention and now issued as US Patent 5,258,236, the teaching of which is incorporated herein by reference. Details of the fabrication of probe head 40 and of the assembly of probe head 40 and 54 will be described herein below."

Replacement paragraph bridging pages 7 and 8:

"Turning now to the figures, Figures 2 and 3 show two embodiments of the test assembly according to the present invention. Numerals common between Figures 2 and 3 represent the same thing. Probe head 40 is formed from a plurality of elongated electrically conducting members 42 embedded in a material 44 which is preferably an elastomeric material 44. The elongated conducting members 42 have ends 46 for probing contact locations on integrated circuit devices 48 of wafer 50. In the preferred embodiment, the workpiece is an integrated circuit such as a semiconductor chip or a semiconductor wafer having a plurality of chips. The workpiece can be any other electronic device. The opposite ends 52 of elongated electrical conductors 42 are in electrical contact with space transformer (or fan-out substrate) 54. In the preferred embodiment, space transformer 54 is a multilevel metal/ceramic substrate, a multilevel metal/polymer substrate or a printed circuit board which are typically used as packaging substrates for integrated circuit chips. Space transformer 54 has, in the preferred embodiment, a surface layer 56 comprising a plurality of thin dielectric films, preferably polymer films such as polyimide, and a plurality of layers of electrical conductors, for example, copper conductors. A process for fabricating multilayer structure 56 for disposing it on surface 58 of substrate 60 to form a space transformer 54 is described

in US patent application Serial No. 07/695,368, filed on May 3, 1991, entitled "MULTI-LAYER THIN FILM STRUCTURE AND PARALLEL PROCESSING METHOD FOR FABRICATING SAME" which is assigned to the assignee of the present invention and now issued as US Patent 5,258,236, the teaching of which is incorporated herein by reference. Details of the fabrication of probe head 40 and of the assembly of probe head 40 and 54 will be described herein below."

Amend the first full paragraph on page 9 as follows:

"In the embodiment of Figure 3, the pin 64 and socket 66 combination of the embodiment of Figure 2 is replaced by an interposer, such as, elastomeric connector 76. The structure of elastomeric connector 76 and the process for fabricating elastomeric connector 76 is described in copending US patent application Serial No. [07/963,364] 07/963,346 to B. Beaman et al., filed October 19, 1992, entitled "THREE DIMENSIONAL HIGH PERFORMANCE INTERCONNECTION MEANS", which is assigned to the assignee of the present invention and now issued as US Patent 5,371,654, the teaching of which is incorporated herein by reference and of which the present application is a continuation-in-part thereof, the priority date of the filing thereof being claimed herein. The elastomeric connector can be opted to have one end permanently bonded to the substrate, thus forming a FRU (field replacement unit) together with the probe/substrate/connector assembly."

Replacement first full paragraph on page 9:

"In the embodiment of Figure 3, the pin 64 and socket 66 combination of the embodiment of Figure 2 is replaced by an interposer, such as, elastomeric connector 76. The structure of elastomeric connector 76 and the process for fabricating elastomeric connector 76 is described in copending US patent application Serial No. 07/963,346 to B. Beaman et al., filed October 19, 1992, entitled "THREE DIMENSIONAL HIGH PERFORMANCE INTERCONNECTION MEANS", which is assigned to the assignee of the present invention and now issued as US Patent

5,371,654, the teaching of which is incorporated herein by reference and of which the present application is a continuation-in-part thereof, the priority date of the filing thereof being claimed herein. The elastomeric connector can be opted to have one end permanently bonded to the substrate, thus forming a FRU (field replacement unit) together with the probe/substrate/connector assembly."

Amend the first full paragraph on page 13 as follows:

"When the wire 130 is severed there is left on the surface 122 of pad 106 an angled flying lead 120 which is bonded to surface 122 at one end and the other end projects outwardly away from the surface. A ball can be formed on the end of the wire 130 which is not bonded to surface 122 using a laser or electrical discharge to melt the end of the wire. Techniques for this are described in co-pending US patent application Serial No. 07/963,346, filed October 19, 1992 and issued now as US Patent 5,371,654, which is incorporated herein by reference above."

Replacement first full paragraph on page 13 as follows:

"When the wire 130 is severed there is left on the surface 122 of pad 106 an angled flying lead 120 which is bonded to surface 122 at one end and the other end projects outwardly away from the surface. A ball can be formed on the end of the wire 130 which is not bonded to surface 122 using a laser or electrical discharge to melt the end of the wire. Techniques for this are described in co-pending US patent application Serial No. 07/963,346, filed October 19, 1992 and issued now as US Patent 5,371,654, which is incorporated herein by reference above."

Amend the paragraph bridging pages 15 and 16 as follows:

"An alternate embodiment of this invention would include straight wires instead of angled wires. Another alternate embodiment could use a suspended alignment mask for aligning the chip to the wire contacts instead of the cup shaped recesses in the top surface of the rigid polymer. The suspended alignment mask is made by ablating holes in a thin sheet of polyimide using an excimers laser and a metal mask with the correct hole pattern. Another alternate embodiment of this design would include a interposer probe assembly that could be made separately from the test substrate as described in US patent application, Serial No. 07/963,364 and issued as US Patent 5,371,654, incorporated by reference herein above. This design could be fabricated by using a copper substrate that would be etched away after the probe assembly is completed and the polymer is cured. This approach could be further modified by using an adhesion de-promoter on the wires to allow them to slide freely (along the axis of the wires) in the polymer material."

Replacement paragraph bridging pages 15 and 16:

"An alternate embodiment of this invention would include straight wires instead of angled wires. Another alternate embodiment could use a suspended alignment mask for aligning the chip to the wire contacts instead of the cup shaped recesses in the top surface of the rigid polymer. The suspended alignment mask is made by ablating holes in a thin sheet of polyimide using an excimers laser and a metal mask with the correct hole pattern. Another alternate embodiment of this design would include a interposer probe assembly that could be made separately from the test substrate as described in US patent application, Serial No. 07/963,364 and issued as US Patent 5,371,654, incorporated by reference herein above. This design could be fabricated by using a copper substrate that would be etched away after the probe assembly is completed and the polymer is cured. This approach could be further modified by using an adhesion de-promoter on the wires to allow them to slide freely (along the axis of the wires) in the polymer material."

Amend the paragraph bridging pages 16 and 17 as follows:

"Figure 14 shows an alternate embodiment of probe tip 40 of Figures 2 and 3. As described herein above, probe tip 40 is fabricated to be originally fixed to the surface of a first level space transformer 54. Each wire 120 is wire bonded directly to a pad 106 on substrate 60 so that the probe assembly 40 is rigidly fixed to the substrate 60. The embodiment of Figure 14, the probe head assembly 40 can be fabricated via a discrete stand alone element. This can be fabricated following the process of US patent application Serial No. [07/963,348] 07/963,346, filed October 19, 1992, which has been incorporated herein by reference above. Following this fabrication process as described herein above, wires 42 of Figure 14 are wire bonded to a surface. Rather than being wire bonded directly to a pad on a space transformation substrate, wire 42 is wire bonded to a sacrificial substrate as described in the application incorporated herein. The sacrificial substrate is removed to leave the structure of Figure 14. At ends 102 of wires 44 there is a flattened ball 104 caused by the wire bond operation. In a preferred embodiment the sacrificial substrate to which the wires are bonded have an array of pits which result in a protrusion 150 which can have any predetermined shape such as a hemisphere or a pyramid. Protrusion 150 provides a raised contact for providing good electrical connection to a contact location against which it is pressed. The clamp assembly 80 of Figures 2 and 3 can be modified so that probe tip assembly 40 can be pressed towards surface 58 of substrate 60 so that ends 104 of Figure 14 can be pressed against contact locations such as 106 of Figure 5 on substrate 60. Protuberances 104 are aligned to pads 100 on surface 58 of Figure 5 in a manner similar to how the conductor ends 86 and 88 of the connector in Figure 4 are aligned to pads 75 and 64 respectively."

Replacement paragraph bridging pages 16 and 17:

"Figure 14 shows an alternate embodiment of probe tip 40 of Figures 2 and 3. As described herein above, probe tip 40 is fabricated to be originally fixed to the surface of a first level space transformer 54. Each wire 120 is wire bonded directly to a pad 106 on substrate 60 so that the probe assembly 40 is rigidly fixed to the substrate 60. The

embodiment of Figure 14, the probe head assembly 40 can be fabricated via a discrete stand alone element. This can be fabricated following the process of US patent application Serial No. 07/963,346, filed October 19, 1992, which has been incorporated herein by reference above. Following this fabrication process as described herein above, wires 42 of Figure 14 are wire bonded to a surface. Rather than being wire bonded directly to a pad on a space transformation substrate, wire 42 is wire bonded to a sacrificial substrate as described in the application incorporated herein. The sacrificial substrate is removed to leave the structure of Figure 14. At ends 102 of wires 44 there is a flattened ball 104 caused by the wire bond operation. In a preferred embodiment the sacrificial substrate to which the wires are bonded have an array of pits which result in a protrusion 150 which can have any predetermined shape such as a hemisphere or a pyramid. Protrusion 150 provides a raised contact for providing good electrical connection to a contact location against which it is pressed. The clamp assembly 80 of Figures 2 and 3 can be modified so that probe tip assembly 40 can be pressed towards surface 58 of substrate 60 so that ends 104 of Figure 14 can be pressed against contact locations such as 106 of Figure 5 on substrate 60. Protuberances 104 are aligned to pads 100 on surface 58 of Figure 5 in a manner similar to how the conductor ends 86 and 88 of the connector in Figure 4 are aligned to pads 75 and 64 respectively."

Amend the first full paragraph on page 10 as follows:

"Alternatively, as shown in Figure [17] 3, connector 76 can be rigidly attached to substrate 54 by solder bonding ends 88 of wires 85 to pads 64 on substrate 54 or by wire bonding ends 86 of wires 85 to pads 64 on substrate 54 in the same manner that wires 42 are bonded to pads 106 as described herein below with respect to Figure 5. Wires 85 can be encased in an elastomeric material in the same manner as wires 42 of Figure 5."

Replacement first full paragraph on page 10:

"Alternatively, as shown in Figure 3, connector 76 can be rigidly attached to substrate 54 by solder bonding ends 88 of wires 85 to pads 64 on substrate 54 or by wire bonding ends 86 of wires 85 to pads 64 on substrate 54 in the same manner that wires 42 are bonded to pads 106 as described herein below with respect to Figure 5. Wires 85 can be encased in an elastomeric material in the same manner as wires 42 of Figure 5."

Amend the paragraph bridging pages 19 and 20 as follows:

"Figure 28 shows a schematic cross-sectional view of another embodiment of the compliant test probe. A thin laminate sheet consisting of Polymer 190/Metal 192/Polymer 194 layers is fabricated with an array of holes 196 corresponding to the ends of the probe wires. The laminate is aligned and placed over the array of wires 198 and supported with a frame 230, which can be either rigid or compliant. <u>A compliant frame can be a flexible support, such as a springy and elastomeric material. The wires 198 project from the surface of substrate 60 through the space between the substrate the support frame 230 and the sheet 194.</u> The frame is attached to a substrate 60. The holes on the top polymer layer 194 has the shape of an oval shape 196. During the alignment and placement process the wire array is first entering into the large portion of the oval shaped hole, then shifted into the small hole and pressed against the wall. The second mask 203 which is made of a thin sheet of polymer and with holes 207 corresponding to the wires array is placed over the wire array 198 and laying on top of the first mask 194. The wire array 198 first enters into the large portion of the oval hole 207 then shifted into the small holes and presses against the polymer wall. The polymer material 194, 203 and 190 can be replaced with any inorganic material, while the metal sheet should be a low thermal expansion material such as Invar, Cu/Invar/Cu, Mo or silicon to match the thermal expansion of the probe array to that of the silicon wafer."

Replacement paragraph bridging pages 19 and 20 as follows:

"Figure 28 shows a schematic cross-sectional view of another embodiment of the compliant test probe. A thin laminate sheet consisting of Polymer 190/Metal 192/Polymer 194 layers is fabricated with an array of holes 196 corresponding to the ends of the probe wires. The laminate is aligned and placed over the array of wires 198 and supported with a frame 230, which can be either rigid or compliant. A compliant frame can be a flexible support, such as a springy and elastomeric material. The wires 198 project from the surface of substrate 60 through the space between the substrate the support frame 230 and the sheet 194. The frame is attached to a substrate 60. The holes on the top polymer layer 194 has the shape of an oval shape 196. During the alignment and placement process the wire array is first entering into the large portion of the oval shaped hole, then shifted into the small hole and pressed against the wall. The second mask 203 which is made of a thin sheet of polymer and with holes 207 corresponding to the wires array is placed over the wire array 198 and laying on top of the first mask 194. The wire array 198 first enters into the large portion of the oval hole 207 then shifted into the small holes and presses against the polymer wall. The polymer material 194, 203 and 190 can be replaced with any inorganic material, while the metal sheet should be a low thermal expansion material such as Invar, Cu/Invar/Cu, Mo or silicon to match the thermal expansion of the probe array to that of the silicon wafer."

IN THE CLAIMS

15. (Amended) A structure according to claim 14 wherein said plurality of groups are arranged in [a m] <u>an</u> array.

15. (Replacement) A structure according to claim 14 wherein said plurality of groups are arranged in an array.

21. (Amended) A structure according to claim 4 wherein said protuberance is [spherelike] sphere like.